THE PREDICTION OF STUDENT ACHIEVEMENT IN HIGH SCHOOL ENGLISH AND SOCIAL SCIENCE BY THE USE OF THE GENERAL APTITUDE TEST BATTERY

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CHAPTER I

INTRODUCTION

Educators are continually searching for means of predicting the academic and vocational success of students. Administrators, counselors, and teachers often use these predictions to help guide students into areas where they can succeed.

The General Aptitude Test Battery, hereinafter referred to as the GATB, has been used by many educators as an aid in predicting the success of vocational placement. This investigation was initiated to determine if the GATB might also be of value in the prediction of high school academic achievement.

I. THE PROBLEM

Statement of the problem. It was the purpose of this study: (1) to evaluate the GATB as an instrument for use as a predictor of student achievement in the subjects of English and social science on the high school level; and (2) to determine if one of four selected GATB aptitudes (G, V, N, and Q) would be a significantly better predictor of achievement in the subjects of English and social science at East High School, Des Moines Independent Community School District, Des Moines, Iowa.

Importance of the study. The placing of students in tracks or ability groups for the subjects of English and social science in the junior and senior high schools of the Des Moines Independent Community School District was started during the 1962-1963 school year.

> The students were placed in the various tracks after consideration of ratings made by the teacher, counselor, past achievement records, evaluation of basic test data, and recommendation of the principal.[1]

One test which has not been used to evaluate the students for placement in the various tracks is the GATB. Prior to the 1964-1965 school year the GATB was only administered to those ninth grade students who expressed an interest in Technical High School. However, starting with the 1964-1965 school year all ninth grade students were administered the eight paper and pencil tests of the GATB as an aid for vocational counseling. Those ninth grade students who expressed an interest in Technical High School were also administered the four apparatus tests of the GATB.

The author of this study believed that the GATB could be used as an aid in determining assignment to the various tracks as well as an aid for vocational counseling. This belief was based on past studies of college students which "indicate a substantial relationship between GATB scores and

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[1]Des Moines Public Schools, Guidance Guidelines (Des Moines: Des Moines Public Schools, 1964), p. 55.

success in a variety of college academic fields."[1]

II. DEFINITIONS OF TERMS USED

General Aptitude Test Battery. The General Aptitude Test Battery is a multiple aptitude test battery of twelve tests which yields nine aptitude scores. The nine aptitudes measured by the GATB are as follows:

Aptitude G: Intelligence
Aptitude V: Verbal Aptitude
Aptitude N: Numerical Aptitude
Aptitude S: Spatial Aptitude
Aptitude P: Form Perception
Aptitude Q: Clerical Perception
Aptitude K: Motor Coordination
Aptitude F: Finger Dexterity
Aptitude M: Manual Dexterity[2]

This battery of tests was constructed by the Bureau of Employment Security of the United States Department of Labor to measure a person's vocational aptitudes. It is designed to facilitate a comparison between an individual's aptitude scores and the Occupational Aptitude Patterns which are the minimum aptitude norm scores a person should have to be a success in a particular occupation.

Tracks. Tracks are the designations given to the

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[1]Bureau of Employment Security, United States Department of Labor, Guide to the Use of the General Aptitude Test Battery, Section III: Development (Washington: United States Department of Labor, 1962), p. 176.

[2]Ibid., pp. 14-15.

various homogeneous ability groups in which students are placed in their English and social science classes in the junior and senior high schools in the Des Moines Independent Community School District. The three tracks in this system of ability grouping are the Advanced (A), the General (G), and the Basic (B).

> The General track is, in essence, the former program which all pupils took. The Basic track includes pupils who cannot succeed in the General and Advanced tracks. The Advanced track is for capable students who are not challenged sufficiently by the general program. In each of the tracks in junior and senior high school the instructional materials as well as teaching methods are differentiated in terms of what the pupils can do.[1]

Expectancy tables. Expectancy tables are used in this study to predict what grades students who took the GATB in ninth grade could expect in English and social science classes at East High School. This was not an attempt to predict the students' exact grades, but an attempt to show what the students' probable chances would be for receiving certain grades in the various tracks with given aptitude scores.

Coefficients of correlation. The coefficient of correlation (r) is the statistical quality that shows to what extent two things are related or to what extent

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[1]Des Moines Public Schools, Guidance Guidelines, loc. cit.

variations in the one compare with variations in the other. The Pearson product-moment method for determining the coefficient of correlation was used in this study.

$$r = \frac{N \cdot \Sigma(fx'y') - (\Sigma fx')(\Sigma fy')}{\sqrt{N \cdot \Sigma(fx'^2) - (\Sigma fx')^2}\ \sqrt{N \cdot \Sigma(fy'^2) - (\Sigma fy')^2}} \quad [1]$$

Coefficient of alienation. The coefficient of alienation (k) is the statistical quality which indicates the degree of lack of relationship between two variables in the same manner which the coefficient of correlation measures the degree of relationship between two variables. Hence, as the coefficient of alienation becomes larger the degree of relationship between the two variables becomes less. The following formula was used in determining the coefficients of alienation in this study:

$$k = \sqrt{1 - r^2} \quad [2]$$

Index of forecasting efficiency. The index of forecasting efficiency (E) is the statistical quality that gives the percentage reduction in errors of prediction that would be made with a pure chance guess. This indicates the predictive ability of a test. The following formula was

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[1] John G. Peatman, Descriptive and Sampling Statistics (New York: Harper and Brothers Publishers, 1947), p. 229.

[2] Ibid., p. 452.

used in determining the index of forecasting efficiency in this study:

$$E = 100(1-k)^{1}$$

III. PROCEDURE

The writer first obtained permission to use the cumulative records of the students in the tenth grade at East High School during the 1965-1966 school year from Dr. E. Raymond Peterson, Director of Secondary Education in the Des Moines Independent Community School District. At the time of this study the tenth grade students were the only students in high school who had taken the GATB in the ninth grade. Only their first semester grades were used since the first semester had just been completed when the data was compiled.

At the end of the first semester of the 1965-1966 school year there were 628 tenth grade students enrolled in East High School. Since only those tenth grade students who had taken the GATB in the ninth grade could be used in this study, seventy-one of the 628 enrolled tenth grade students were eliminated from consideration. These students were eliminated because: (1) forty were not in the ninth grade in the Des Moines Independent Community School District

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[1] Ibid., p. 460.

during the 1964-1965 school year and as a result did not take the GATB; (2) sixteen had not taken the GATB in ninth grade even though they had attended the ninth grade in the Des Moines Independent Community School District; (3) seven were tenth grade repeaters and when they were in ninth grade in the Des Moines Independent Community School District the GATB was not administered; and (4) eight had transferred after the end of the semester and their test scores had been sent to their new schools.

From the total of 557 tenth grade students who had taken the GATB in the ninth grade, nineteen more were eliminated in the computation of the correlations between the selected GATB aptitudes and the English grades because they did not have any English grades for the first semester. This was because they had dropped English during the semester or had received incomplete grades for the semester.

Therefore, the number of students who could be used in determining correlations between the English grades and the selected GATB aptitudes was 538 of whom 301 were females and 237 were males.

In determining the correlations between the selected GATB aptitudes and the grades in social science, 550 of the 557 tenth grade students with ninth grade GATB scores were used. The seven students that were eliminated from this group did not have any World History grades which is the

required social science course in the tenth grade of the Des Moines Independent Community School District. These students had either dropped the course or had done incomplete work in it.

There were 305 females and 245 males in the group of 550 students used in determining the correlations between the selected GATB aptitudes and the social science grades.

The Des Moines Independent Community School District uses a numerical grading system. The number one represents the highest possible grade with five representing a failure. The grades received in tracked subjects are weighted for the purpose of determining class rank. Grades used in this study for the computation of the correlations were weighted in the same manner. Grades in tracked subjects in the Des Moines Independent Community School District are weighted in the following manner for the determination of class rank:[1]

ADVANCED		GENERAL		BASIC	
Grade Points	Grade	Grade Points	Grade	Grade Points	Grade
0	1	1	1	2	1
1	2	2	2	3	2
2	3	3	3	4	3
3	4	4	4	5	4
4	5	5	5	6	5

[1]Des Moines Public Schools, "Procedures for Reporting Pupil Progress to Parents in Secondary Schools" (Des Moines: Des Moines Public Schools, Revised 1965-1966), p. 1. (Mimeographed)

Two other factors had to be taken into consideration when working with the grades. The first factor to be considered was the incomplete grades of students for the first semester. Since their final grades were not known at the time of this study, incomplete grades were eliminated.

Students receiving T-5's at the end of the first semester presented another factor for consideration. It was decided they would be considered as failures since they had actually failed the first semester. A T-5 is given a student when he fails the first semester of a two semester subject and he is allowed to continue in the second semester of the subject. A student is allowed to do this when the student's counselor and teacher recommend this and the principal also gives his approval. If the student takes the second semester of a subject and receives a grade of four or higher a grade of four will be placed in the records for the first semester.[1] Since this would be an actual failure in the first semester with an opportunity for the student to prove himself in the second semester, it was still regarded in this study as a failure.

The four selected GATB aptitudes used in this study were Aptitudes G, V, N, and Q. These four aptitudes were selected for correlation with the students' English and

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[1] Ibid., p. 4.

social science grades on the basis of information obtained incidentally in other studies, which were constructed primarily for other purposes, that indicated these were the best predictors of high school success.[1]

Eight correlations were calculated for the purpose of determining if any one of the four selected GATB aptitudes was a better predictor of student achievement in high school English and social science classes. Each of the four selected GATB aptitudes was correlated with the students' grades in English and also, with the students' grades in social science. The Pearson product-moment method was used to determine the correlations.

Expectancy tables were prepared for each of the tracks in English and social science and each of the four selected GATB aptitudes. These were developed not to show the students the exact grades they would earn in each track with given aptitude scores, but to show the students' probable chances for receiving certain grades in each track with given aptitude scores. This was necessary since the tables used in computing the correlations were composed of weighted grades which made it impossible to determine the track or the grades of the students at a certain aptitude level.

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[1] Bureau of Employment Security, United States Department of Labor, Guide to the Use of the General Aptitude Test Battery, Section III: Development (Washington: United States Department of Labor, 1962), pp. 176-179.

IV. ASSUMPTIONS AND LIMITATIONS

The basic assumptions of this study were: (1) the GATB as a standardized test was properly administered and accurately scored in the five junior high schools where it was given to the students used in this study; (2) the weighting of grades as done by the Des Moines Independent Community School District for the purpose of determining class rank is done in a fair and equitable manner and by using the same method, the grades in this study were weighted in a fair and equitable manner; (3) the students already tracked in this study had been placed in the proper tracks according to the information available to their counselors; (4) the various teachers in assigning grades to the students used as nearly as possible the same grading standards; and (5) the criteria used in determining the correlations had a linear relationship.

In the writing of this study, certain limitations were encountered. The gathering of test information and students' grades from only one high school limited the value of the study's findings for use by other high schools. However, this did not limit, but increased its value to the administrators, counselors, and teachers at East High School where the information was gathered.

Since only the tenth grade students were used in

determining if the selected GATB aptitudes could be used as predictors of student achievement in English and social science classes on the high school level, some people may question the value of the findings of this study as a predictor of student achievement in these two subjects in the eleventh and twelfth grades. This was not considered a major limitation to this study as there is no reason to assume that the findings in it would have differed greatly if each of the grades had been examined separately or as a group. This is because the GATB aptitude scores of students tested in ninth grade have considerable stability in terms of relationship to the scores made by the same students three years later in twelfth grade.[1] Some people may further claim that the mental growth of students at these levels because it is very rapid can be characterized as a growth that is very unstable and unpredictable. This was not considered to be a serious limitation to this study because the mere fact of rapid mental growth at these levels does not mean the rate of growth is necessarily one of instability and unpredictability.[2]

Another limitation was the use of an aptitude test as a predictor of achievement. Aptitude tests can help

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[1] Ibid., pp. 180-183.

[2] Samuel R. Pinneau, "Changes in the Intelligence Quotient With Age," Testing Today (Boston: Houghton Mifflin Company, 1962), p. 5.

determine the level a student should achieve, but it must be remembered that aptitude tests do not determine whether the student will reach this level because they can not determine to what extent the student will develop his aptitudes. Such factors as interests, motivation, and incentive can affect the student's development. While such factors undoubtedly affected the results of this study, this was not considered to be a serious limitation. The size of the sample used should have been large enough to keep any extreme development or lack of development by an individual caused by these factors from greatly influencing the findings of this study.

CHAPTER II

REVIEW OF THE LITERATURE

A review of the literature showed few studies using the GATB as a predictive instrument for academic achievement on the high school level, but found many studies which indicated the GATB is a substantial predictor of academic achievement on the college level. In most studies of the GATB as a predictor of academic achievement on the high school level, the data was obtained incidentally in studies conducted primarily for other purposes.[1]

In the Guide to the Use of the General Aptitude Test Battery, Section III: Development, seven studies reported on the use of the GATB as a predictor of overall high school achievement. The results were not fully comparable due to the procedure for selecting the sample, the number of times the sample was tested and the different types of criteria used for the various studies.[2] However, a weighted average was found by using Fisher's z transformation[3] for the seven

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[1] Bureau of Employment Security, United States Department of Labor, Guide to the Use of the General Aptitude Test Battery, Section III: Development (Washington: United States Department of Labor, 1962), p. 176.

[2] Ibid., pp. 176-177.

[3] Ibid., p. 178, citing R. A. Fisher, Statistical Methods for Research Workers (tenth edition; London: Oliver and Boyd, 1948), p. 204.

studies used in determining the concurrent validity of the GATB administered at the twelfth grade level to overall high school achievement. The same method was applied to the three studies used in determining the predictive validity of the GATB administered at the ninth grade level to overall high school achievement. Fisher's z transformation[1] and formulas forty-seven and forty-nine in McNemar[2] were used for determining the significance of the differences between the concurrent validity coefficients of the twelfth grade and the predictive validity coefficients of the ninth grade.[3]

From the weighted average validity coefficients it was concluded that GATB aptitude scores made by students in twelfth grade were significantly related to overall high school achievement and that Aptitudes G, V, N, and Q have the highest validities. Also, it was concluded that Aptitudes G, V, N, and Q in the ninth grade have the highest validity although all the aptitudes were significantly related to overall high school achievement.[4]

Table I shows the validity coefficients of the GATB aptitude scores made by the students at the ninth and twelfth

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[1] Ibid., p. 179, citing R. A. Fisher, Statistical Methods for Research Workers (tenth edition; London: Oliver and Boyd, 1948), p. 204.

[2] Ibid., p. 179, citing Q. McNemar, Psychological Statistics (New York: Wiley, 1949), pp. 124-125.

[3] Ibid., p. 179.

[4] Ibid., pp. 178-179.

TABLE I

THE WEIGHTED AVERAGE VALIDITY COEFFICIENTS FOR NINTH GRADE AND TWELFTH GRADE STUDENTS' GATB APTITUDE SCORES AND THE STUDENTS' OVERALL ACHIEVEMENT IN HIGH SCHOOL AND THE DIFFERENCES IN THE WEIGHTED VALIDITY COEFFICIENTS FOR 663 STUDENTS WHO WERE TESTED INITIALLY IN NINTH GRADE AND WERE RETESTED IN TWELFTH GRADE[1]

Grade in Which Tested	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Grade Nine	.53	.52	.56	.17	.37	.56	.32	.26	.21
Grade Twelve	.56	.58	.55	.31	.43	.55	.33	.31	.26
Differences in Validity Coefficients	-.03	-.06[a]	.01	-.14[a]	-.06[b]	.01	-.01	-.05	-.05

[a]Significant at the .01 level.

[b]Significant at the .05 level.

grade levels and their overall high school achievement. The four aptitudes most highly related to overall high school achievement have validity coefficients in the .50's for both ninth and twelfth grade samples. These coefficients are significant for both grade levels at the .01 level.[2] According to Droege, "Statistical tests of significance indicate the probability of obtaining correlations of these

[1]Ibid., p. 180.

[2]Ibid., pp. 178-179.

magnitudes by chance is less than one in 10,000."[1]

Table I shows there is substantial relationship between Aptitudes G, V, N, and Q of the GATB and high school achievement and that aptitudes obtained in the ninth grade provide reasonably good prediction of future high school achievement. The table also shows that of these four aptitudes only Aptitude V had a significantly higher twelfth grade concurrent validity (r = .58), than ninth grade predictive validity (r = .52).[2]

The GATB has good stability of measurement between the ninth and twelfth grades when the term is used to mean the relationship between the initial test scores and the retest scores of a specified group of individuals and not to the amount of increase or decrease in the level of scores over a period of time. This was determined by comparing students in eight studies who were tested in ninth grade and were retested in twelfth grade and another group of students who were tested and retested in the twelfth grade.[3]

Table II shows the stability coefficients for the

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[1]Robert C. Droege, "GATB Norms for Lower High School Grades," The Personnel and Guidance Journal, XXXIX (September, 1960), 31.

[2]Bureau of Employment Security, United States Department of Labor, Guide to the Use of the General Aptitude Test Battery, Section III: Development (Washington: United States Department of Labor, 1962), p. 179.

[3]Ibid., p. 180.

TABLE II

STABILITY COEFFICIENTS FOR A COMBINED SAMPLE OF 1,159 STUDENTS TESTED TWICE IN TWELFTH GRADE, WEIGHTED AVERAGE STABILITY COEFFICIENTS FOR EIGHT SAMPLES TOTALING 1,100 STUDENTS TESTED INITIALLY IN NINTH GRADE AND RETESTED IN TWELFTH GRADE, AND THE DIFFERENCES IN STABILITY COEFFICIENTS FOR THESE TWO GROUPS FOR THE APTITUDES OF THE GATB[1]

Grade at Initial Testing	G	V	N	S	P	Q	K	F	M
Grade Twelve	.87	.86	.84	.81	.73	.75	.81	.67[b]	.73[b]
Grade Nine	.76	.74	.77	.76	.64	.77	.69	.65	.64
Differences in Stability Coefficients	.11[a]	.12[a]	.07[a]	.05[a]	.09[a]	-.02	.12[a]	.02	.09[a]

[a]Significant at the .01 level.

[b]The number was 1,000 for twelfth grade on Aptitudes F and M.

sample of students tested twice in the twelfth grade and the weighted average stability coefficients for the eight samples tested initially in the ninth grade and retested in the twelfth grade. It also shows the differences between these two groups for the various aptitudes of the GATB. The significance of these differences was determined by Fisher's

[1]Ibid., p. 183.

z transformation[1] and formula forty-five in McNemar.[2] All the stability coefficients are significantly higher for the twelfth grade sample than the ninth grade sample except for Aptitudes F and Q. Part of the differences was no doubt due to the interval between testing which was three months for the group tested twice in the twelfth grade and three years for the groups tested in the ninth and twelfth grades. Assuming that the time interval between testings was a factor, we may tentatively conclude that the stability of scores of ninth grade students compares favorably with the stability of scores of individuals who have reached aptitudal maturity.[3]

In two studies which have been conducted since the publication of the Guide to the Use of the General Aptitude Test Battery in 1962, additional information on the ability of the GATB to predict high school achievement has been established. Wysong in his study of the GATB for use in the ninth and tenth grades states, "The G, V, and N scores of the GATB can be used as measures of scholastic aptitudes. These measures compare favorably with other tests of school

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[1] Ibid., p. 182, citing R. A. Fisher, Statistical Methods for Research Workers (tenth edition; London: Oliver and Boyd, 1948), p. 204.

[2] Ibid., p. 182, citing Q. McNemar, Psychological Statistics (New York: Wiley, 1949), pp. 124-125.

[3] Ibid., pp. 182-183.

learning ability."[1]

A study of 4,000 Ohio ninth and tenth grade students in 1964 by Ingersoll compared the relationships between the students GATB aptitude scores and grade point averages. Ingersoll reported multiple correlations of .650 in ninth grade, .673 in tenth grade, and .645 for the total sample. The aptitudes with significant beta weights in the regression equation for the total population were G, V, N, and Q.[2]

Ingersoll further reported that regardless of the significance of the aptitudes evaluated and the grades used as criterion about one-half or less of the variance in grades will be associated with the aptitudes.

> The major causes for this are: (1) Many factors which may contribute to success as measured by the criterion are not found in aptitude tests; (2) Less than a perfect degree of reliability of the predictor variables [aptitudes] would cause some of the variance difference; and (3) The evaluation practices in secondary schools would cause the criterion variables [grades] to assume a degree of unreliability.[3]

All the coefficients of correlations found in this review of the literature denote substantial correlation between the four GATB aptitudes used in this study and

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[1] H. E. Wysong, "The Use of the General Aptitude Test Battery in Grades Nine and Ten," The Personnel and Guidance Journal, XLIII (January, 1965), 510.

[2] Ralph W. Ingersoll and Herman J. Peters, "Predictive Indices of the GATB," The Personnel and Guidance Journal, XLIV (May, 1966), 936.

[3] Ibid., 935-936.

overall high school achievement. Coefficients of correlations are evaluated by Froehlich and Hoyt in the following manner:

.80 and up	Very high correlation
.50 to .79	Substantial correlation
.30 to .49	Some correlation
.20 to .29	Slight correlation
.00 to .19	Practically no correlation[1]

The coefficients of correlation may not seem very high in the review of the literature for the use of the GATB as a predictor of academic achievement, but according to Guilford they do have significance.

> Common experience shows that the validity coefficient for a single test may be expected within the range from .00 to .60, with most indices in the lower part of the range. . . . Many who have employed tests for vocational guidance and vocational selection have followed a tradition . . . that the minimum validity coefficient for a test of practical usefulness is about .45. Recent experiences have shown that this standard is too rigid and that there are many considerations other than validity which determine the usefulness of a test in any given situation.[2]

Cottle and Downie further stated, "The typical validity coefficient for predicting academic grades is in

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[1]Clifford P. Froehlich and Kenneth B. Hoyt, Guidance Testing (third edition; Chicago: Science Research Associates, Inc., 1959), p. 59.

[2]J. P. Guilford, Fundamental Statistics in Psychology and Education (fourth edition; New York: McGraw-Hill Inc., 1965), pp. 103-104.

the .50's. Very seldom is a validity coefficient above .70 found."[1]

Thus, the question still remains, how high should a validity coefficient be before it can be used for making a valid prediction? The consensus of many studies seems to be that as long as the predictive ability of a test is the best available, it should be used while recognizing its limitations. Although research revealed that test scores alone should not be used as the single criterion for achievement, the correlations found in this review of the literature indicate that GATB scores can be a successful aid in the prediction of achievement.

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[1] William C. Cottle and N. M. Downie, Procedures and Preparation for Counseling (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1960), p. 151.

CHAPTER III

PRESENTATION OF DATA

It was the purpose of this study: (1) to evaluate the GATB as an instrument for use as a predictor of student achievement in the subjects of English and social science on the high school level; and (2) to determine if one of four selected GATB Aptitudes (G, V, N, and Q) would be a significantly better predictor of achievement in the subjects of English and social science at East High School, Des Moines Independent Community School District.

To evaluate the GATB as a predictor of student achievement in high school English and social science and to determine if one of the GATB aptitudes of G, V, N, and Q was a better predictor of achievement in these two subjects the writer computed eight coefficients of correlations.

The Pearson product-moment method was used for determining the coefficients for each of the four GATB aptitudes and the students' first semester grades in English. Four other coefficients were calculated for each of the GATB aptitudes and the students' first semester grades in social science by using the same method.

Aptitude V had the highest relationship with achievement in both English and social science. The coefficients were .639 with the students' English grades and .619 with

their grades in social science. The aptitude with the lowest relationship to achievement in English and social science was Aptitude Q. It had a coefficient of .337 with the students' grades in English and .290 with grades in social science. The eight coefficients and the tables used in their calculation can be located in Appendix pages 60 through 75. The coefficients of these eight correlations are as follows:

Aptitude G with English grades	:	.612
Aptitude V with English grades	:	.639
Aptitude N with English grades	:	.471
Aptitude Q with English grades	:	.337
Aptitude G with social science grades	:	.587
Aptitude V with social science grades	:	.619
Aptitude N with social science grades	:	.455
Aptitude Q with social science grades	:	.291

These coefficients of correlations were then used to determine the coefficients of alienation ($k = \sqrt{1-r^2}$). The following are the computed coefficients of alienation.

Aptitude G with English grades	:	.791
Aptitude V with English grades	:	.769
Aptitude N with English grades	:	.882
Aptitude Q with English grades	:	.941
Aptitude G with social science grades	:	.810
Aptitude V with social science grades	:	.785

Aptitude N with social science grades : .691

Aptitude Q with social science grades : .957

Coefficients of alienation are used to measure the degree of lack of relationship between two variables in the same manner the coefficient of correlation measures the degree of relationship. Hence, as the coefficient of alienation becomes larger the degree of relationship between two variables becomes smaller. Since the coefficients of alienation actually do not give any more information than the coefficients of correlation, they would not be necessary if they were not needed in the computation of the index of forecasting efficiency.

The index of forecasting efficiency $E = 100(1-k)$ is used to determine the percentage reduction in errors of prediction that would be made with a pure chance guess. The percentage improvement in predictive ability of the GATB aptitudes for students' grades as determined by the index of forecasting efficiency are as follows:

Aptitude G with English grades : 21%

Aptitude V with English grades : 23%

Aptitude N with English grades : 12%

Aptitude Q with English grades : 6%

Aptitude G with social science grades : 19%

Aptitude V with social science grades : 21%

Aptitude N with social science grades : 11%

Aptitude Q with social science grades : 4%

In this study Aptitude V would have the predictive ability of twenty-three per cent improvement over pure chance in the prediction of achievement in English and a twenty-one per cent improvement over pure chance in the prediction of achievement in social science. Assuming predictions made by pure chance to be right fifty times out of one hundred cases, predictions of English achievement based on Aptitude V would be expected to be successful sixty-one to sixty-two times out of a hundred cases. When using Aptitude V for predictions of achievement in social science it could be expected that the predictions would be successful in sixty to sixty-one of the cases predicted.

Expectancy tables were prepared for each of the tracks in English and social science and each of the four GATB aptitudes. Thus, a counselor can predict for a student his possible achievement in the various tracks in each subject with a particular known percentage of accuracy. These tables were not an attempt to show a student the exact grade he could earn in each track, but to show him his probable chances for receiving certain grades in each track with given aptitude scores. This is not only because the test itself is not one hundred per cent accurate, but also because the individual student may also be influenced by such factors as motivation, interests, and incentive.

TABLE III

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK ENGLISH FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139				1	
130-134					2
125-129				4	
120-124			2	8	5
115-119		1	5	9	6
110-114		2	9	12	6
105-109			12	19	3
100-104			3	7	
95- 99			7	1	
90- 94			4	2	
85- 89			1		
80- 84				1	
75- 79					
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE IV

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK ENGLISH FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 346 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134			1		
125-129					
120-124				3	
115-119			2	1	
110-114		3	6	7	4
105-109		3	17	17	2
100-104	3	1	24	22	1
95- 99	2	4	31	17	3
90- 94	1	7	33	5	1
85- 89	2	14	30	6	3
80- 84	1	7	22	1	
75- 79	3	2	6	1	
70- 74	1	6	8	1	
65- 69		2	4	1	
60- 64			3		
55- 59		1			
50- 54					
45- 49					
40- 44					

TABLE V

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK ENGLISH FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 60 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134	1				
125-129					
120-124					
115-119					
110-114					
105-109					
100-104				1	
95- 99		1	2	1	
90- 94			2	3	
85- 89	2	1	8	3	1
80- 84		6	3	2	
75- 79		1	4	2	
70- 74			3	2	
65- 69		3	3		
60- 64	1		2	1	
55- 59			1		
50- 54					
45- 49					
40- 44					

TABLE VI

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK ENGLISH FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144				1	1
135-139					
130-134				1	2
125-129				2	2
120-124			1	3	4
115-119		1	5	13	4
110-114			5	6	2
105-109		2	13	14	4
100-104			9	13	1
95- 99			3	6	1
90- 94			5	3	
85- 89			2	2	
80- 84					
75- 79					
70- 74					
65- 69					1
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE VII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK ENGLISH FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 346 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124					1
115-119				4	
110-114			1	4	1
105-109			14	15	4
100-104		3	21	15	2
95- 99	2	7	26	17	1
90- 94	3	11	30	13	1
85- 89	3	9	43	10	4
80- 84	3	9	31	4	
75- 79	2	6	14		
70- 74		3	5		
65- 69		2	1		
60- 64			1		
55- 59					
50- 54					
45- 49					
40- 44					

TABLE VIII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK ENGLISH FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 60 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124					
115-119					
110-114					
105-109	1				
100-104					
95- 99			2		
90- 94		1	2	1	
85- 89	1	1	7	4	
80- 84	1	3	4	3	
75- 79		1	5	4	
70- 74	1	2	7	2	1
65- 69		4	1	1	
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE IX

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK ENGLISH FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129				2	1
120-124			3	3	1
115-119				5	1
110-114			4	9	5
105-109			7	10	4
100-104		3	15	18	7
95- 99			4	8	2
90- 94			5	5	1
85- 89			3	4	
80- 84			2		
75- 79					
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE X

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK ENGLISH FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 346 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129			1	1	
120-124		2	1	1	
115-119			4	1	1
110-114		1	6	6	2
105-109		1	8	10	
100-104	2	3	23	17	3
95- 99	2	2	35	14	3
90- 94	1	7	42	15	
85- 89	1	12	32	8	
80- 84	2	5	17	4	
75- 79	1	3	11	2	
70- 74	1	3	3	1	
65- 69	1	6			
60- 64	1	3	2		
55- 59		2	2	2	
50- 54	1				
45- 49					
40- 44					

TABLE XI

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK ENGLISH FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 60 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169		1			
160-164					
155-159					
150-154					
145-149					
140-144	1				
135-139					
130-134					
125-129					
120-124					
115-119					
110-114					
105-109					
100-104					
95- 99		1	2	2	1
90- 94			2	2	
85- 89		4	7	2	
80- 84		2	5	1	
75- 79	2	1	1	4	
70- 74		1	4	1	
65- 69		1	2	1	
60- 64	1		1	1	
55- 59			3		
50- 54				1	
45- 49		1	1		
40- 44					

TABLE XII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK ENGLISH FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159			1		
150-154					
145-149					
140-144					1
135-139				1	
130-134			1	2	
125-129			1	1	
120-124			3	2	1
115-119			3	6	3
110-114			9	19	3
105-109			5	11	3
100-104		1	5	5	4
95- 99		2	5	7	3
90- 94			2	3	
85- 89			5	7	3
80- 84			1		1
75- 79			2		
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XIII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK ENGLISH FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 346 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154			1		
145-149					
140-144			1	1	
135-139			1	1	
130-134					1
125-129				2	
120-124	1	2	5	5	
115-119		1	5	2	
110-114			10	9	1
105-109	1	3	27	5	3
100-104		6	15	15	2
95- 99		8	44	14	
90- 94	3	3	21	8	3
85- 89	6	10	31	10	2
80- 84	1	7	16	3	1
75- 79		9	6	7	1
70- 74			2		
65- 69	1		1		
60- 64			1		
55- 59		1			
50- 54					
45- 49					
40- 44					

TABLE XIV

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK ENGLISH FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 60 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124					
115-119	1		1	1	1
110-114			3		
105-109		1	2	2	
100-104		2	3	1	
95- 99		3	4	3	
90- 94		1	5		
85- 89		1	4	4	
80- 84	1	1	3	1	
75- 79	1	2		2	
70- 74	1	1	1	1	
65- 69					
60- 64					
55- 59					
50- 54			1		
45- 49			1		
40- 44					

TABLE XV

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK SOCIAL SCIENCE FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					1
130-134				1	1
125-129			1	3	
120-124		1	4	7	3
115-119			3	11	5
110-114	1	5	10	11	2
105-109		6	11	14	3
100-104			6	3	
95- 99		2	4	3	
90- 94		4	2	1	
85- 89		1	2		
80- 84					
75- 79					
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XVI

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK SOCIAL SCIENCE FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 341 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139				1	
130-134					
125-129				1	2
120-124			1	3	1
115-119			5	10	2
110-114	1	1	16	6	7
105-109	1	8	24	13	4
100-104	3	9	21	18	2
95- 99		14	18	6	2
90- 94	3	19	22	5	2
85- 89		24	11	3	
80- 84	3	12	2	1	
75- 79		8	4	2	
70- 74	3	7	2		
65- 69		4	2		
60- 64		1			
55- 59		1			
50- 54					
45- 49					
40- 44					

TABLE XVII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK SOCIAL SCIENCE FROM APTITUDE G OF THE GENERAL APTITUDE TEST BATTERY OF 77 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134	1				
125-129					
120-124					
115-119					
110-114					
105-109					
100-104				1	
95- 99	1		2	3	
90- 94		1		4	
85- 89	2	2	5	5	
80- 84	2		10	2	
75- 79	2		6	3	
70- 74		1	4	1	1
65- 69	1	2	3		1
60- 64	1	1		2	1
55- 59		1	1		
50- 54					
45- 49					
40- 44					

TABLE XVIII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK SOCIAL SCIENCE FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144				2	
135-139					
130-134				1	2
125-129				2	2
120-124			1	4	2
115-119		1	6	11	3
110-114		1	3	9	1
105-109		4	13	15	3
100-104		6	7	3	1
95- 99		3	5	5	1
90- 94	1	3	5		
85- 89			2	2	
80- 84		1			
75- 79					
70- 74					
65- 69			1		
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XIX

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK SOCIAL SCIENCE FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 341 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124			1	1	1
115-119			1	3	1
110-114			1	2	2
105-109		2	9	12	8
100-104	1	9	21	13	2
95- 99	3	9	20	12	4
90- 94	2	22	24	6	2
85- 89	1	34	22	14	2
80- 84	3	17	18	4	
75- 79	4	8	6	1	
70- 74		4	3	1	
65- 69		2	2		
60- 64		1			
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XX

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK SOCIAL SCIENCE FROM APTITUDE V OF THE GENERAL APTITUDE TEST BATTERY OF 77 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT. DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124					
115-119					
110-114					
105-109	1				
100-104			2		
95- 99		1	2	4	
90- 94			4	4	3
85- 89	2		8	4	
80- 84	3	2	7	5	2
75- 79	2	1	7	3	2
70- 74		2	1	1	
65- 69	2	2			
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XXI

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK SOCIAL SCIENCE FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129			1	1	1
120-124		1	2	2	1
115-119			2	2	2
110-114		2	2	10	3
105-109		1	9	7	3
100-104	1	5	11	16	4
95- 99		2	8	8	
90- 94		3	4	5	1
85- 89		2	4	3	
80- 84		3			
75- 79					
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XXII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK SOCIAL SCIENCE FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 341 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169			1		
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129				2	
120-124	1	2		1	1
115-119		1	1	3	1
110-114		2	8	4	2
105-109		4	10	5	1
100-104	3	9	21	15	6
95- 99		15	22	10	5
90- 94	3	21	25	12	3
85- 89	1	21	20	8	3
80- 84	2	13	7	5	
75- 79	2	6	7	2	
70- 74	1	5	1	1	
65- 69		4	1		
60- 64	1	3			
55- 59		2	3	1	
50- 54			1		
45- 49					
40- 44					

TABLE XXIII

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK SOCIAL SCIENCE FROM APTITUDE N OF THE GENERAL APTITUDE TEST BATTERY OF 77 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144	1				
135-139					
130-134					
125-129					
120-124					
115-119					
110-114					
105-109					
100-104			1	6	1
95- 99			2	1	1
90- 94		1	6	5	3
85- 89		2	8	1	
80- 84	2		2	3	1
75- 79	4		2	1	
70- 74	2	1	3	2	1
65- 69			2	1	
60- 64	1	1	3	1	
55- 59		1	1		
50- 54			1		
45- 49		1			
40- 44		1			

TABLE XXIV

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN ADVANCED TRACK SOCIAL SCIENCE FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 132 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144				1	
135-139				1	
130-134		1		2	
125-129			1	1	
120-124		1	2	2	
115-119		2	2	5	3
110-114	1	2	14	9	2
105-109			6	7	3
100-104		2	6	5	3
95- 99		5	5	13	
90- 94		1	2	2	
85- 89		4	2	4	3
80- 84			1	1	1
75- 79		1	2	1	
70- 74					
65- 69					
60- 64					
55- 59					
50- 54					
45- 49					
40- 44					

TABLE XXV

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN GENERAL TRACK SOCIAL SCIENCE FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 341 STUDENTS FROM LAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159				1	
150-154			1		
145-149					
140-144			1	1	
135-139			1	1	
130-134			1		
125-129				2	
120-124		4	6	1	2
115-119	1	4	5		
110-114	1	4	9	9	
105-109		16	14	10	4
100-104		8	10	11	6
95- 99	3	27	19	9	3
90- 94	1	10	18	7	1
85- 89	5	21	18	9	5
80- 84	2	9	12	3	1
75- 79	1	3	10	4	
70- 74		1	2		
65- 69				1	
60- 64			1		
55- 59		1			
50- 54					
45- 49					
40- 44					

TABLE XXVI

EXPECTANCY TABLE FOR THE PREDICTION OF STUDENT ACHIEVEMENT IN BASIC TRACK SOCIAL SCIENCE FROM APTITUDE Q OF THE GENERAL APTITUDE TEST BATTERY OF 77 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA

Aptitude Scores	Grades				
	5	4	3	2	1
165-169					
160-164					
155-159					
150-154					
145-149					
140-144					
135-139					
130-134					
125-129					
120-124				1	
115-119	1				1
110-114				3	
105-109			3		2
100-104		3	4		1
95- 99		1	5	4	1
90- 94	1	1	3	1	
85- 89			11	4	1
80- 84	1		4	3	
75- 79	3	2		4	1
70- 74	2		1		
65- 69	1	1			
60- 64					
55- 59					
50- 54	1			1	
45- 49					
40- 44					

CHAPTER IV

SUMMARY AND CONCLUSIONS

It was the purpose of this study: (1) to evaluate the GATB as an instrument for use as a predictor of student achievement in the subjects of English and social science on the high school level; and (2) to determine if one of four selected GATB aptitudes (G, V, N, and Q) would be a significantly better predictor of student achievement in the subjects of English and social science at East High School, Des Moines Independent Community School District, Des Moines, Iowa.

To evaluate the GATB as a predictor of student achievement in high school English and social science and to determine if one of the GATB Aptitudes of G, V, N, and Q was a better predictor of achievement in these two subjects the author computed eight coefficients of correlation. The coefficients of these eight correlations are as follows:

Aptitude G with English grades	:	.612
Aptitude V with English grades	:	.639
Aptitude N with English grades	:	.471
Aptitude Q with English grades	:	.337
Aptitude G with social science grades	:	.567
Aptitude V with social science grades	:	.619
Aptitude N with social science grades	:	.455

Aptitude Q with social science grades : .291

The coefficients of correlation in this study expressed a mixed degree of relationship for both subjects if Froehlichs and Hoyt's[1] standards are used. According to their standards Aptitudes G and V denoted a substantial relationship to achievement in both subjects. Aptitude N had some relationship to both subjects and Aptitude Q had some correlation with English and a slight correlation with social science achievement. However, Aptitudes G and V fell in the range of most validity coefficients used for predicting grades. According to Cottle and Downie, "The typical validity coefficient for predicting grades is in the .50's. Very seldom is a validity coefficient above .70 found."[2]

Based on the results of this study and the opinions of experts as to how high a coefficient should be before it can contribute substantially to making a prediction, the author concluded that Aptitude V would be the most valid for predicting student achievement in the subjects of English and social science in high school. Aptitude G can also be used for the same purpose with very little loss in the level of successful prediction. However, the use of Aptitudes N and Q would not sufficiently improve the predictions made by a

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[1] Froelich and Hoyt, loc. cit.

[2] Cottle and Downie, loc. cit.

pure chance guess.

The coefficients of correlation were then used to compute the coefficients of alienation which were needed for the computation of the index of forecasting efficiency. This gives the percentage reduction in errors of prediction that would be made with a pure chance guess. The percentage improvement in predictive ability of the GATB aptitudes for student achievement in high school English and social science classes over a pure chance guess is as follows:

Aptitude G with English grades	:	21%
Aptitude V with English grades	:	23%
Aptitude N with English grades	:	12%
Aptitude Q with English grades	:	6%
Aptitude G with social science grades	:	19%
Aptitude V with social science grades	:	21%
Aptitude N with social science grades	:	11%
Aptitude Q with social science grades	:	4%

Thus, Aptitude V is twenty-three per cent better than a pure chance guess in the prediction of English achievement and twenty-one per cent better than a pure chance guess in the prediction of social science achievement. Aptitude G is almost as effective with a twenty-one per cent better than pure chance guess in English achievement and a nineteen per cent better than pure chance guess in social science achievement. Aptitudes N and Q had percentage levels of

twelve per cent or less over a pure chance guess in the prediction of English and social science achievement.

It was of interest to the author of this study that Aptitudes N and Q had low predictive validity coefficients when compared to Aptitudes G and V, despite the fact in the review of the literature all four aptitudes were found to be of substantial value in the prediction of high school achievement. The reason it was assumed they were not as high in this study is that in the data in the review of the literature they were used for the prediction of overall high school achievement and not just for certain subjects. Since only two subjects were used that were primarily verbal in nature, it was assumed that Aptitudes G and V were higher because of this and Aptitudes N and Q would have been much higher if the subjects had also been numerical and verbal in nature.

Expectancy tables were prepared for each of the tracks in English and social science and each of the four GATB aptitudes. These were the actual predictive tools for predicting student achievement in high school English and social science. These tables were not an attempt to show a student the exact grades he would earn in each track, but to show him his probable chances for receiving certain grades in each track with given GATB aptitude scores.

The coefficients of correlation for Aptitudes G and V

appear high enough to be valid for the prediction of student achievement in high school English and social science. This would indicate that the GATB which in the past has been used primarily as a predictor of vocational success has certain aptitudes which also can be used for the prediction of academic achievement. However, it must be remembered that this test is just one source of information to be used for making predictions and that all sources of information available should be used when making predictions.

The author also realized the need for doing further study on this subject when students who have taken the GATB in ninth grade have completed their high school education and not just their first semester of the tenth grade as this study was forced to do.

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APPENDIX

APPENDIX A

CORRELATION BETWEEN GATB APTITUDE G SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE ENGLISH OF 538 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144									8				
135-139						1		1	7	7	49	2	14
130-134	1			1			2	4	6	24	144	3	18
125-129						4		4	5	20	100	8	40
120-124					5	8	5	18	4	72	288	36	144
115-119				3	6	9	6	24	3	72	216	42	126
110-114			3	8	16	16	6	49	2	98	196	63	126
105-109			3	17	29	21	3	73	1	73	73	77	77
100-104		3	1	25	25	8		62	0	0	0	34	0
95- 99		3	6	32	24	4		69	-1	-69	69	20	-20
90- 94		1	9	36	9	3		58	-2	-116	232	4	-8
85- 89	2	3	22	33	8	3		71	-3	-213	639	-20	60
80- 84		7	10	24	1	1		43	-4	-172	688	-21	84
75- 79		4	6	8	1			19	-5	-95	475	-13	65
70- 74		1	9	10	1			21	-6	-126	756	-10	60
65- 69		3	5	4	1			13	-7	-91	637	-10	70

APPENDIX A (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	$f(y'^2)$	$\Sigma fx'$	$\Sigma fx'(y')$
60 -64	1		2	4				7	-8	-56	448	-5	40
55 -59			2					2	-9	-18	162	-2	18
50 -54									-10				
45 -49									-11				
40 -44									-12				
fx	4	25	78	205	126	78	22	538		-590	5,172	208	914
x'	-3	-2	-1	0	1	2	3						
f(x')	-12	-50	-78	0	126	156	66	208					
$f(x'^2)$	36	100	78	0	126	312	198	850					

COEFFICIENT OF CORRELATION = .612

APPENDIX B

CORRELATION BETWEEN GATB APTITUDE V SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE ENGLISH OF 538 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144						1	1	2	8	16	128	5	40
135-139									7				
130-134						1	2	3	6	18	108	8	48
125-129						2	2	4	5	20	100	10	50
120-124					1	4	4	9	4	36	144	21	84
115-119				1	9	13	4	27	3	81	243	47	141
110-114				1	9	7	2	19	2	38	76	29	58
105-109	1			16	28	18	4	67	1	67	67	73	73
100-104			3	21	24	15	1	64	0	0	0	54	0
95- 99		2	9	26	20	7	1	65	-1	-65	65	24	-24
90- 94		4	13	31	18	4		70	-2	-140	280	5	-10
85- 89	1	4	16	47	12	6		86	-3	-258	774	-3	9
80- 84	1	6	13	34	4			58	-4	-232	928	-24	96
75- 79		3	11	18				32	-5	-160	800	-17	85
70- 74	1	2	10	7	1			21	-6	-126	756	-16	96
65- 69		4	3	2			1	10	-7	-70	490	-8	56

APPENDIX B (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	$f(y'^2)$	Σfx'	Σfx'(y')
60- 64				1				1	-8	-8	64	0	0
55- 59									-9				
50- 54									-10				
45- 49									-11				
40- 44									-12				
fx	4	25	78	205	126	78	22	538		-783	5,023	208	802
x'	-3	-2	-1	0	1	2	3						
f(x')	-12	-50	-78	0	126	156	66	208					
$f(x'^2)$	36	100	78	0	126	312	198	850					

COEFFICIENT OF CORRELATION = .639

APPENDIX C

CORRELATION BETWEEN GATB APTITUDE N SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE ENGLISH OF 538 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169		1						1	13	13	169	-2	-26
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144	1							1	8	8	64	-3	-24
135-139									7				
130-134									6				
125-129				1	1	2	1	5	5	25	125	8	40
120-124			2	1	4	3	1	11	4	44	176	11	44
115-119				4	1	6	1	12	3	36	108	16	48
110-114			1	6	10	11	5	33	2	66	132	46	92
105-109			1	8	17	10	4	40	1	40	40	48	48
100-104		2	3	26	32	21	7	91	0	0	0	88	0
95- 99		3	4	37	19	11	2	76	-1	-76	76	37	-37
90- 94		1	9	44	20	5	1	80	-2	-160	320	22	-44
85- 89		5	19	34	11	8		77	-3	-231	693	-2	6
80- 84		4	10	18	6	1		39	-4	-156	624	-10	40
75- 79	2	2	4	15	2			25	-5	-125	625	-12	60
70- 74		2	7	4	1			14	-6	-84	504	-10	60
65- 69		2	8	1				11	-7	-77	539	-12	84

APPENDIX C (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
60- 64	1	1	4	3				9	-8	-72	576	-9	72
55- 59			5	2	2			9	-9	-81	729	-3	27
50- 54		1		1				2	-10	-20	200	-2	20
45- 49		1	1					2	-11	-22	242	-3	33
40- 44									-12				
fx	4	25	78	205	126	78	22	538		-872	5,942	208	543
x'	-3	-2	-1	0	1	2	3						
f(x')	-12	-50	-78	0	126	156	66	208					
f(x'^{2})	36	100	78	0	126	312	198	850					

COEFFICIENT OF CORRELATION = .471

APPENDIX D

CORRELATION BETWEEN GATB APTITUDE Q SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE ENGLISH OF 538 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159					1			1	11	11	121	1	11
150-154				1				1	10	10	100	0	0
145-149									9				
140-144				1	1		1	3	8	24	192	4	32
135-139				1	1	1		3	7	21	147	3	21
130-134					1	3		4	6	24	144	7	42
125-129					3	1		4	5	20	100	5	25
120-124		1	2	5	8	2	1	19	4	76	304	11	44
115-119	1		2	6	6	6	3	24	3	72	216	22	66
110-114			3	10	18	20	3	54	2	108	216	64	128
105-109		2	5	29	10	14	3	63	1	63	63	38	38
100-104		2	9	17	20	7	4	59	0	0	0	33	0
95- 99		3	12	49	19	7	3	93	-1	-93	93	24	-24
90- 94		4	8	21	10	6		49	-2	-98	196	6	-12
85- 89		7	14	35	15	9	3	83	-3	-249	747	14	-42
80- 84	1	2	10	17	4	1	1	36	-4	-144	576	-8	32
75- 79	1	2	9	8	9	1		30	-5	-150	750	-5	25
70- 74	1	1	1	3				6	-6	-36	216	-6	36
65- 69		1		1				2	-7	-14	98	-2	14

APPENDIX D (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	fx'	fx'(y')
60- 64				1				1	-8	-8	64	0	0
55- 59			1					1	-9	-9	81	-1	9
50- 54			1					1	-10	-10	100	-1	10
45- 49			1					1	-11	-11	121	-1	11
40- 44									-12				
fx	4	25	78	205	126	78	22	538		-393	4,645	208	466
x'	-3	-2	-1	0	1	2	3						
f(x')	-12	-50	-78	0	126	156	66	208					
f(x'^{2})	36	100	78	0	126	312	198	850					

COEFFICIENT OF CORRELATION = .337

APPENDIX E

CORRELATION BETWEEN GATB APTITUDE G SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE SOCIAL SCIENCE OF 550 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144									8				
135-139							1	1	7	7	49	3	21
130-134	1				1	1	1	4	6	24	144	3	18
125-129					1	3		4	5	20	100	7	35
120-124				1	5	9	3	18	4	72	288	32	128
115-119				1	6	12	5	24	3	72	216	45	135
110-114		1	2	10	20	13	2	48	2	96	192	48	96
105-109		1	8	22	17	21	3	72	1	72	72	58	58
100-104		3	9	25	19	7		63	0	0	0	18	0
95- 99	1		16	26	23	5		71	-1	-71	71	14	-14
90- 94		4	19	26	9	3		61	-2	-122	244	-12	24
85- 89	2	2	29	28	8	2		71	-3	-213	639	-27	81
80- 84	2	3	22	13	4			44	-4	-176	704	-30	120
75- 79	2		14	5	1			22	-5	-110	550	-19	95
70- 74		4	11	5	3			23	-6	-138	828	-16	96
65- 69	1	2	7	2	1			13	-7	-91	637	-13	91

APPENDIX E (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	$f(y'^2)$	$\Sigma fx'$	$\Sigma fx'(y')$
60- 64	1	1	1	4	1			8	-8	-64	512	-5	40
55- 59		1	2					3	-9	-27	243	-4	36
50- 54									-10				
45- 49									-11				
40- 44									-12				
fx	10	22	140	168	119	76	15	550		-649	5,489	102	1,060
x'	-3	-2	-1	0	1	2	3						
f(x')	-30	-44	-140	0	119	152	45	102					
$f(x'^2)$	90	88	140	0	119	304	135	876					

COEFFICIENT OF CORRELATION = .587

APPENDIX F

CORRELATION BETWEEN GATB APTITUDE V SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE SOCIAL SCIENCE OF 550 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144						2		2	8	16	128	4	32
135-139									7				
130-134						1	2	3	6	18	108	8	48
125-129						2	2	4	5	20	100	10	50
120-124				1	2	5	2	10	4	40	160	18	72
115-119				2	9	12	3	26	3	78	234	42	126
110-114				2	5	11	1	19	2	38	76	30	60
105-109	1		2	13	25	23	3	67	1	67	67	75	75
100-104		1	9	27	20	5	1	63	0	0	0	22	0
95- 99		4	11	23	17	9	1	65	-1	-65	65	19	-19
90- 94		2	25	31	11	2		71	-2	-142	284	-14	28
85- 89	2	1	38	26	19	4		90	-3	-270	810	-19	57
80- 84	3	5	25	23	4			60	-4	-240	960	-40	160
75- 79	2	5	15	11	3			36	-5	-180	900	-28	140
70- 74		2	11	6	3			22	-6	-132	792	-12	72
65- 69	2	2	3	3	1			11	-7	-77	539	-12	84

APPENDIX F (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
60- 64			1					1	-8	-8	64	-1	8
55- 59									-9				
50- 54									-10				
45- 49									-11				
40- 44									-12				
fx	10	22	140	168	119	76	15	550		-837	5,287	102	993
x'	-3	-2	-1	0	1	2	3						
f(x')	-30	-44	-140	0	119	152	45	102					
f(x'^{2})	90	88	140	0	119	304	135	876					

COEFFICIENT OF CORRELATION = .619

APPENDIX G

CORRELATION BETWEEN GATB APTITUDE N SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE SOCIAL SCIENCE OF 550 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169				1				1	13	13	169	0	0
160-164									12				
155-159									11				
150-154									10				
145-149									9				
140-144	1							1	8	8	64	-3	-24
135-139									7				
130-134									6				
125-129					3	1	1	5	5	25	125	8	40
120-124		1	2	1	3	3	1	11	4	44	176	8	32
115-119			1	1	5	3	2	12	3	36	108	16	48
110-114			2	10	6	12	3	33	2	66	132	37	74
105-109			4	11	14	8	3	40	1	40	40	35	35
100-104		3	10	26	26	22	4	91	0	0	0	66	0
95- 99			16	30	19	13		78	-1	-78	78	29	-29
90- 94		4	23	29	17	8	1	82	-2	-164	328	5	-10
85- 89		3	27	27	15	6		78	-3	-234	702	-6	18
80- 84	2	2	21	11	5			41	-4	-164	656	-26	104
75- 79	4	2	8	10	3			27	-5	-135	675	-21	105
70- 74	2	2	7	2	1			14	-6	-84	504	-16	96
65- 69			7	3	1			11	-7	-77	539	-6	42

APPENDIX G (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	$f(y'^2)$	$\Sigma fx'$	$\Sigma fx'y'$
60- 64	1	2	5	1				9	-8	-72	576	-12	96
55- 59		1	5	4	1			11	-9	-99	891	-6	54
50- 54			1	1				2	-10	-20	200	-1	10
45- 49		1	1					2	-11	-22	242	-3	33
40- 44		1						1	-12	-12	144	-2	24
fx	10	22	140	168	119	76	15	550		-929	6,349	102	748
x'	-3	-2	-1	0	1	2	3						
f(x')	-30	-44	-140	0	119	152	45	102					
$f(x'^2)$	90	88	140	0	119	304	135	876					

COEFFICIENT OF CORRELATION = .455

APPENDIX H

CORRELATION BETWEEN GATB APTITUDE Q SCORES AND FIRST SEMESTER GRADES RECEIVED IN TENTH GRADE SOCIAL SCIENCE OF 550 STUDENTS FROM EAST HIGH SCHOOL, DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT, DES MOINES, IOWA, IN THE 1965-1966 SCHOOL YEAR

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
165-169									13				
160-164									12				
155-159					1			1	11	11	121	1	11
150-154				1				1	10	10	100	0	0
145-149									9				
140-144				1	1	1		3	8	24	192	3	24
135-139				1	1	1		3	7	21	147	3	21
130-134				2		2		4	6	24	144	4	24
125-129					3	1		4	5	20	100	5	25
120-124			4	8	3	4		19	4	76	304	7	28
115-119	1	1	4	7	3	5	3	24	3	72	216	13	39
110-114		1	5	14	23	9	2	54	2	108	216	40	80
105-109			19	14	18	11	3	65	1	65	65	30	30
100-104		3	12	12	18	11	3	59	0	0	0	31	0
95- 99		4	32	28	15	16		95	-1	-95	95	7	-7
90- 94	1	2	13	20	9	3		48	-2	-96	192	-5	10
85- 89		5	32	26	12	9	3	87	-3	-261	783	-3	9
80- 84	1	2	13	15	4	2	1	38	-4	-152	608	-9	36
75- 79	3	3	3	15	7	1		32	-5	-160	800	-9	45
70- 74	2		2	2				6	-6	-36	216	-8	48
65- 69	1	1			1			3	-7	-21	147	-4	28

APPENDIX H (continued)

Aptitude Scores	Weighted Grades 6	5	4	3	2	1	0	fy	y'	f(y')	f(y'^{2})	Σfx'	Σfx'(y')
60- 64				1				1	-8	-8	64	0	0
55- 59			1					1	-9	-9	81	-1	9
50- 54	1							1	-10	-10	100	-3	30
45- 49				1				1	-11	-11	121	0	0
40- 44									-12				
fx	10	22	140	168	119	76	15	550		-428	4,812	102	490
x'	-3	-2	-1	0	1	2	3						
f(x')	-30	-44	-140	0	119	152	45	102					
f(x'^{2})	90	88	140	0	119	304	135	876					

COEFFICIENT OF CORRELATION = .291